

# 74FST3125

## 4-Bit Bus Switch

The ON Semiconductor 74FST3125 is a quad, high performance switch. The device is CMOS TTL compatible when operating between 4 and 5.5 Volts. The device exhibits extremely low  $R_{ON}$  and adds nearly zero propagation delay. The device adds no noise or ground bounce to the system.

The device consists of four independent 1-bit switches with separate Output/Enable ( $\overline{OE}$ ) pins. Port A is connected to Port B when  $\overline{OE}$  is low. If  $\overline{OE}$  is high, the switch is high Z.

### Features

- $R_{ON} < 4 \Omega$  Typical
- Less Than 0.25 ns–Max Delay Through Switch
- Nearly Zero Standby Current
- No Circuit Bounce
- Control Inputs are TTL/CMOS Compatible
- Pin–For–Pin Compatible With QS3125, FST3125, CBT3125
- All Popular Packages: QSOP–16, TSSOP–14, SOIC–14
- All Devices in Package TSSOP are Inherently Pb–Free\*

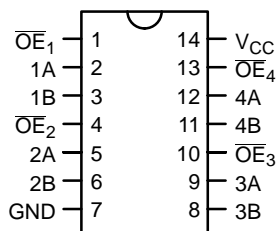


Figure 1. Pin Assignment for SOIC and TSSOP

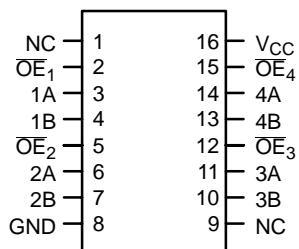


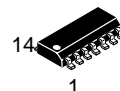
Figure 2. Pin Assignment for QSOP



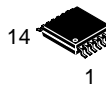
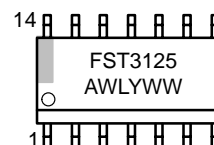
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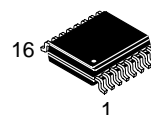
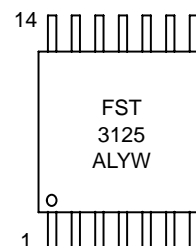
### MARKING DIAGRAMS



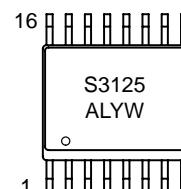
SOIC–14  
D SUFFIX  
CASE 751A



TSSOP–14  
DT SUFFIX  
CASE 948G



QSOP–16  
QS SUFFIX  
CASE 492



A = Assembly Location  
L, WL = Wafer Lot  
Y = Year  
W, WW = Work Week

### PIN NAMES

Pin	Description
$\overline{OE}_1, \overline{OE}_2, \overline{OE}_3, \overline{OE}_4$	Bus Switch Enables
1A, 2A, 3A, 4A	Bus A
1B, 2B, 3B, 4B	Bus B
NC	Not Connected

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## 74FST3125

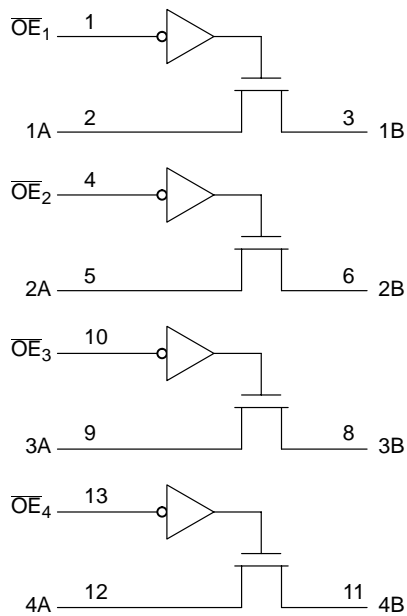


Figure 3. Logic Diagram

### TRUTH TABLE

Inputs	Outputs
$\overline{OE}$	A, B
L	A = B
H	Z

### ORDERING INFORMATION

Device Order Number	Package	Shipping†
74FST3125D	SOIC-14	55 Units / Rail
74FST3125DR2	SOIC-14	2500 Units / Tape & Reel
74FST3125DT	TSSOP* (Pb-Free)	96 Units / Rail
74FST3125DTR2	TSSOP* (Pb-Free)	2500 Units / Tape & Reel
74FST3125QS	QSOP-16	96 Units / Rail
74FST3125QSR	QSOP-16	2500 Units / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*This package is inherently Pb-Free.

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## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage	-0.5 to +7.0	V
$V_I$	DC Input Voltage	-0.5 to +7.0	V
$V_O$	DC Output Voltage	-0.5 to +7.0	V
$I_{IK}$	DC Input Diode Current $V_I < GND$	-50	mA
$I_{OK}$	DC Output Diode Current $V_O < GND$	-50	mA
$I_O$	DC Output Sink Current	128	mA
$I_{CC}$	DC Supply Current per Supply Pin	$\pm 100$	mA
$I_{GND}$	DC Ground Current per Ground Pin	$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	$^{\circ}C$
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	$^{\circ}C$
$T_J$	Junction Temperature Under Bias	+150	$^{\circ}C$
$\theta_{JA}$	Thermal Resistance (Note 1) SOIC TSSOP QSOP	125 170 200	$^{\circ}C/W$
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3)	> 2000 > 200	V
$I_{Latchup}$	Latchup Performance Above $V_{CC}$ and Below GND at 85 $^{\circ}C$ (Note 4)	$\pm 500$	mA

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	Supply Voltage Operating, Data Retention Only	4.0	5.5	V
$V_I$	Input Voltage (Note )	0	5.5	V
$V_O$	Output Voltage (HIGH or LOW State)	0	$V_{CC}$	V
$T_A$	Operating Free-Air Temperature	-40	+85	$^{\circ}C$
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate Switch Control Input Switch I/O	0 0	5 DC	ns/V

5. Unused control inputs may not be left open. All control inputs must be tied to a high- or low-logic input voltage level.

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40°C to +85°C			Unit
				Min	Typ*	Max	
V <sub>IK</sub>	Clamp Diode Resistance	I <sub>IN</sub> = -18mA	4.5			-1.2	V
V <sub>IH</sub>	High-Level Input Voltage		4.0 to 5.5	2.0			V
V <sub>IL</sub>	Low-Level Input Voltage		4.0 to 5.5			0.8	V
I <sub>I</sub>	Input Leakage Current	0 ≤ V <sub>IN</sub> ≤ 5.5 V	5.5			±1.0	μA
I <sub>OZ</sub>	OFF-STATE Leakage Current	0 ≤ A, B ≤ V <sub>CC</sub>	5.5			±1.0	μA
R <sub>ON</sub>	Switch On Resistance (Note 6)	V <sub>IN</sub> = 0 V, I <sub>IN</sub> = 64 mA	4.5		4	7	Ω
		V <sub>IN</sub> = 0 V, I <sub>IN</sub> = 30 mA	4.5		4	7	
		V <sub>IN</sub> = 2.4 V, I <sub>IN</sub> = 15 mA	4.5		8	15	
		V <sub>IN</sub> = 2.4 V, I <sub>IN</sub> = 15 mA	4.0		11	20	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0	5.5			3	μA
ΔI <sub>CC</sub>	Increase In I <sub>CC</sub> per Input	One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	5.5			2.5	mA

\*Typical values are at V<sub>CC</sub> = 5.0 V and T<sub>A</sub> = 25°C.

6. Measured by the voltage drop between A and B pins at the indicated current through the switch.

## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	Figures	Limits				Unit
				T <sub>A</sub> = -40°C to +85°C				
				V <sub>CC</sub> = 4.5 to 5.5 V		V <sub>CC</sub> = 4.0 V		
				Min	Max	Min	Max	
t <sub>PHL</sub> , t <sub>PLH</sub>	Prop Delay Bus to Bus (Note 7)	V <sub>I</sub> = OPEN	4 and 5		0.25		0.25	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time	V <sub>I</sub> = 7 V for t <sub>PZL</sub> V <sub>I</sub> = OPEN for t <sub>PZH</sub>	4 and 5	1.0	5.0		5.5	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Output Disable Time	V <sub>I</sub> = 7 V for t <sub>PLZ</sub> V <sub>I</sub> = OPEN for t <sub>PHZ</sub>	4 and 5	1.5	5.3		5.6	ns

7. This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).

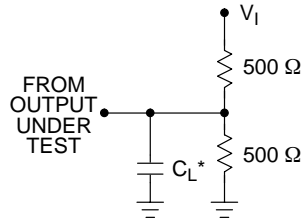
## CAPACITANCE (Note 8)

Symbol	Parameter	Conditions	Typ	Max	Unit
C <sub>IN</sub>	Control Pin Input Capacitance	V <sub>CC</sub> = 5.0 V	3		pF
C <sub>I/O</sub>	Input/Output Capacitance	V <sub>CC</sub> , $\overline{OE}$ = 5.0 V	5		pF

8. T<sub>A</sub> = +25°C, f = 1 MHz, Capacitance is characterized but not tested.

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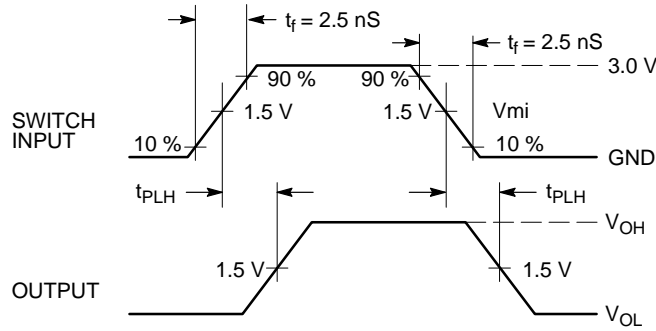
## AC Loading and Waveforms



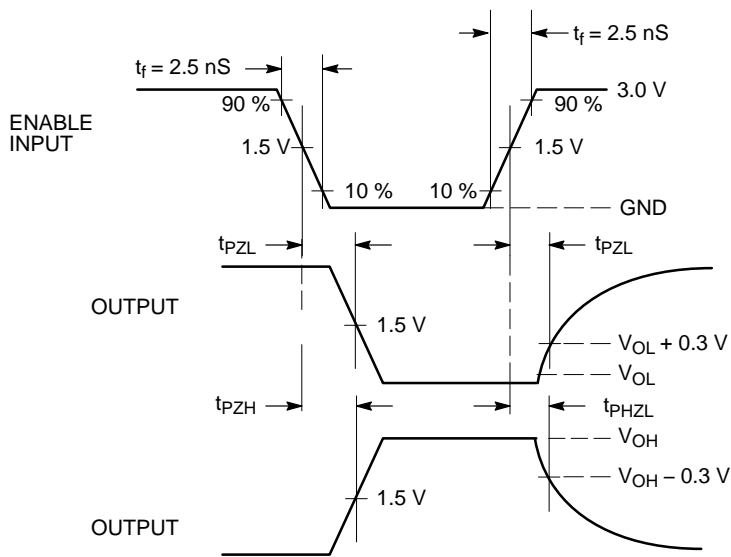
**NOTES:**

1. Input driven by 50 Ω source terminated in 50 Ω.
  2. C<sub>L</sub> includes load and stray capacitance.
- \*C<sub>L</sub> = 50 pF

**Figure 4. AC Test Circuit**



**Figure 5. Propagation Delays**

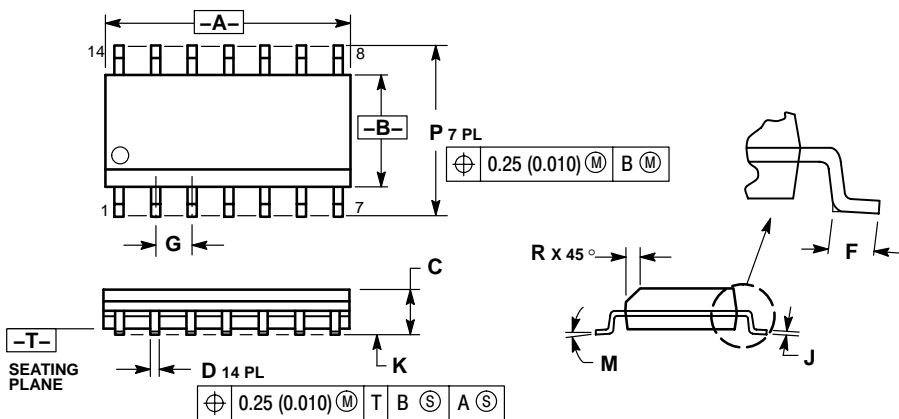


**Figure 6. Enable/Disable Delays**

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## PACKAGE DIMENSIONS

### SOIC-14 D SUFFIX CASE 751A-03 ISSUE G

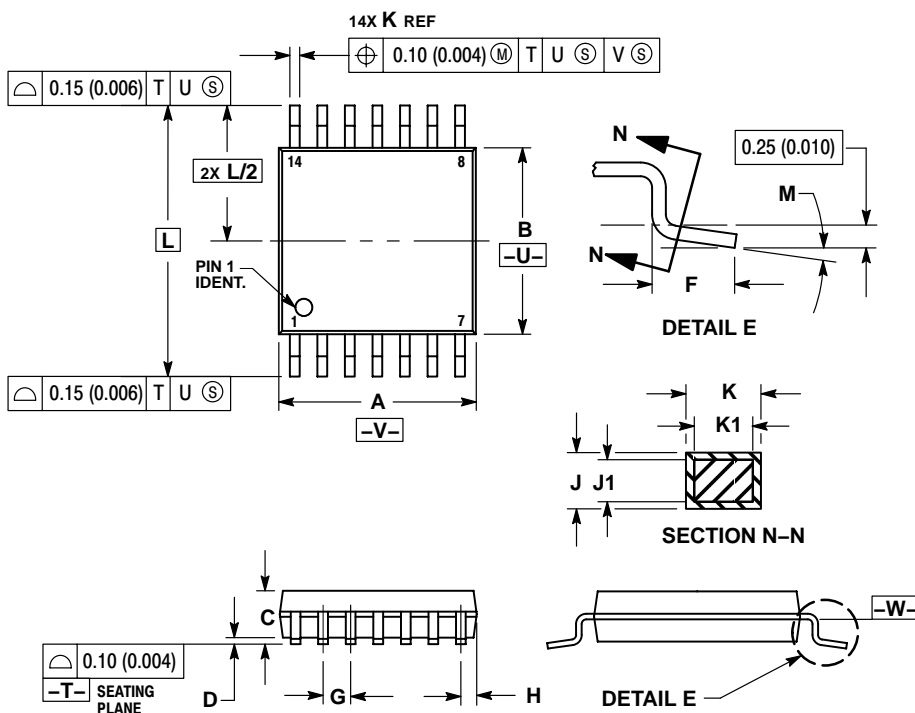


#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

### TSSOP-14 DT SUFFIX CASE 948G-01 ISSUE O



#### NOTES:

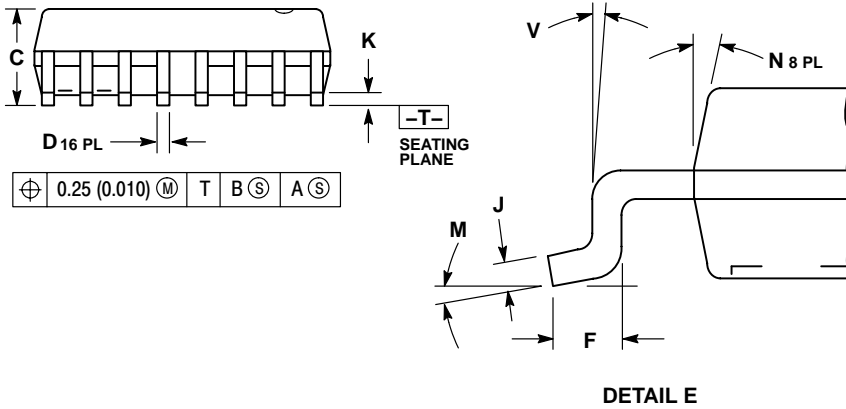
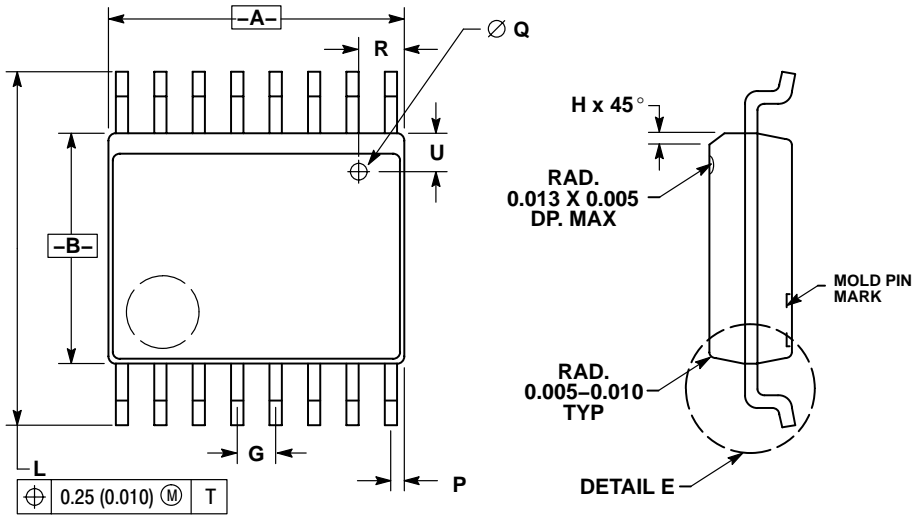
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

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## PACKAGE DIMENSIONS

QSOP-16  
 QS SUFFIX  
 CASE 492-01  
 ISSUE O



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. THE BOTTOM PACKAGE SHALL BE BIGGER THAN THE TOP PACKAGE BY 4 MILS (NOTE: LEAD SIDE ONLY). BOTTOM PACKAGE DIMENSION SHALL FOLLOW THE DIMENSION STATED IN THIS DRAWING.
4. PLASTIC DIMENSIONS DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 6 MILS PER SIDE.
5. BOTTOM EJECTOR PIN WILL INCLUDE THE COUNTRY OF ORIGIN (COO) AND MOLD CAVITY I.D.

DIM	INCHES		MILLIMETERS	
	MAX	MIN	MAX	MIN
A	0.189	0.196	4.80	4.98
B	0.150	0.157	3.81	3.99
C	0.061	0.068	1.55	1.73
D	0.008	0.012	0.20	0.31
F	0.016	0.035	0.41	0.89
G	0.025 BSC		0.64 BSC	
H	0.008	0.018	0.20	0.46
J	0.0098	0.0075	0.249	0.191
K	0.004	0.010	0.10	0.25
L	0.230	0.244	5.84	6.20
M	0°	8°	0°	8°
N	0°	7°	0°	7°
P	0.007	0.011	0.18	0.28
Q	0.020 DIA		0.51 DIA	
R	0.025	0.035	0.64	0.89
U	0.025	0.035	0.64	0.89
V	0°	8°	0°	8°

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